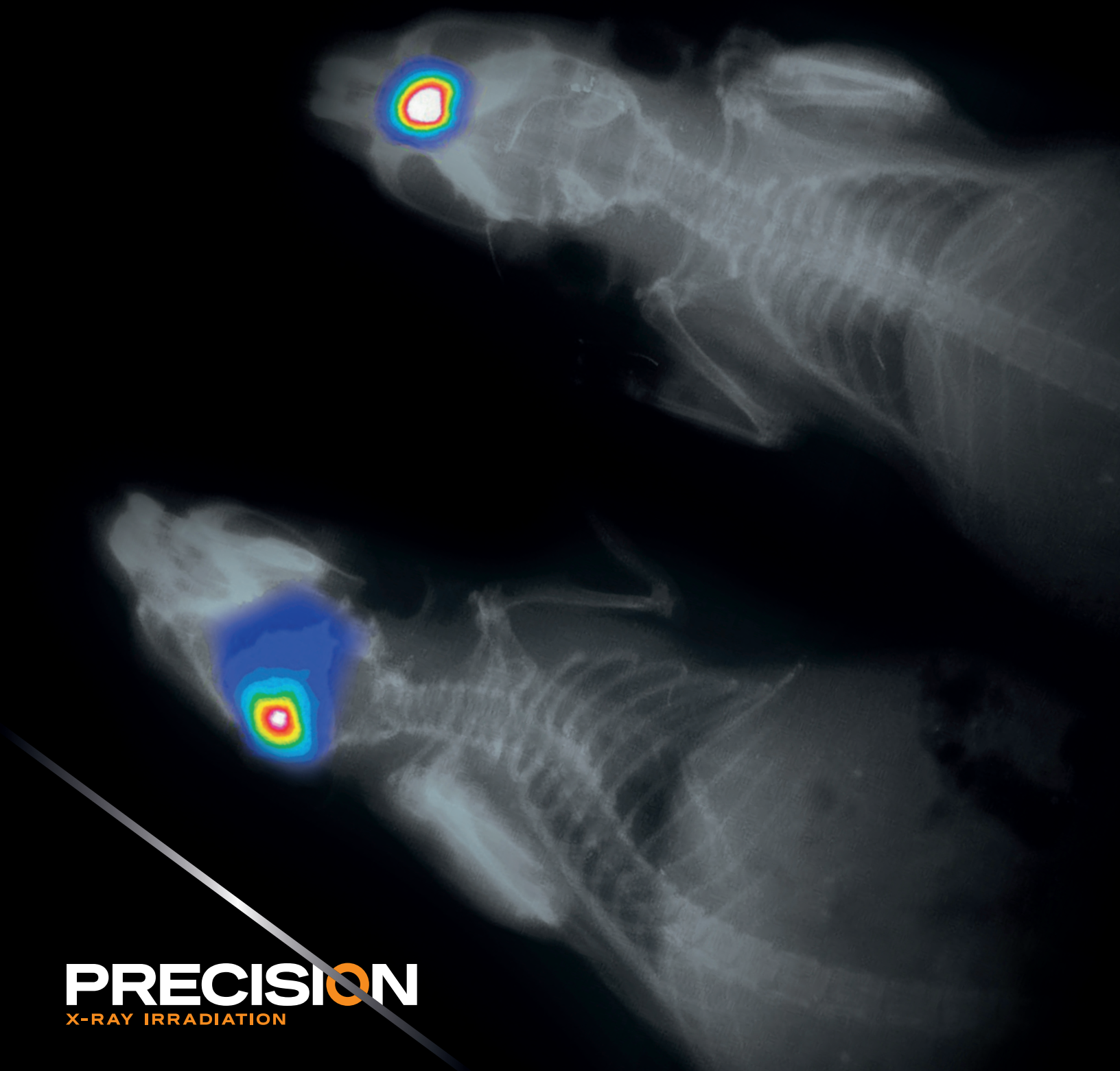
Product Data

OptiMAX

Imaging Module combines Optical/Bioluminescence and X-ray for Molecular Image-Guided Radiation Therapy



PRECISION
X-RAY IRRADIATION

OptiMAX is a multimodal imaging module available as an option for your X-Rad biological irradiator

Target tumors with x-ray, luminsecence imaging, and dose field imaging

The OptiMAX Imaging Module for Optical/ Bioluminescent and x-ray Molecular Image-Guided Radiotherapy (M-IGRT) has been designed for insertion into the market leading X-Rad320, X-Rad225XL and X-Rad160XL biological irradiation systems.

Providing researchers with the only high energy x-ray irradiation system that also combines bioluminescent and x-ray imaging for cells, tissue or small animals. Used for pretreatment image guided localization of target tissues or post treatment diagnostics at a molecular and functional level.

This super cooled CCD based system allows the researcher to image animals in both x-ray mode and optical mode; then combine the images in a precise fashion to allow excellent co-registration of luminescent tumors or target tissues on an x-ray background.

The imaging module can also be used to provide precise localization and documentation of high-energy collimated dose fields. All this can be accomplished without ever having to move the animal between imaging modalities or radiation treatment protocols.

Key Features

- **Easily integrates into your X-Rad Biological Irradiator**
- **Image-Guided Radiotherapy (IGRT) to better target the tumor while avoiding normal tissue**
- **Provides Radioisotopic and X-ray Luminescence Imaging**
- **Supports Tetraflow - 5 Nose Cone Mouse Imaging Chamber**
- **High sensitivity, super cooled CCD camera**
- **180mm Field of View**

Tetraflow - 5 Nose Cone Mouse Imaging Chamber

Luminescence and X-ray Imaging

The OptiMAX can be used to capture high sensitivity, high resolution optical molecular images of light coming from animals both pre and post irradiation.

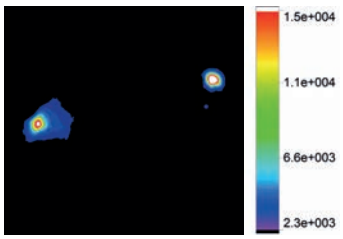
The example below shows bioluminescent luciferase activity from Athymic Nude Luciferase Glioblastoma mouse models to aid in the targeting of tumors for RT treatment in mice brains.

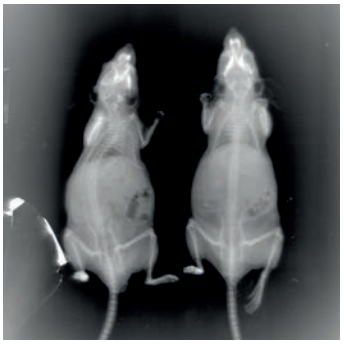
Athymic Nude Glioblastoma Mouse Model

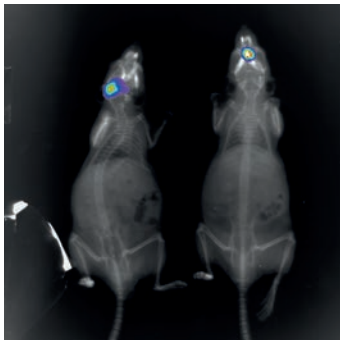
Luciferase activity determined by Dr. Rozin (Harvard) and Dr. Rao Papineni

Imaging by X-Rad320 with OptiMAX

Luminescence Image







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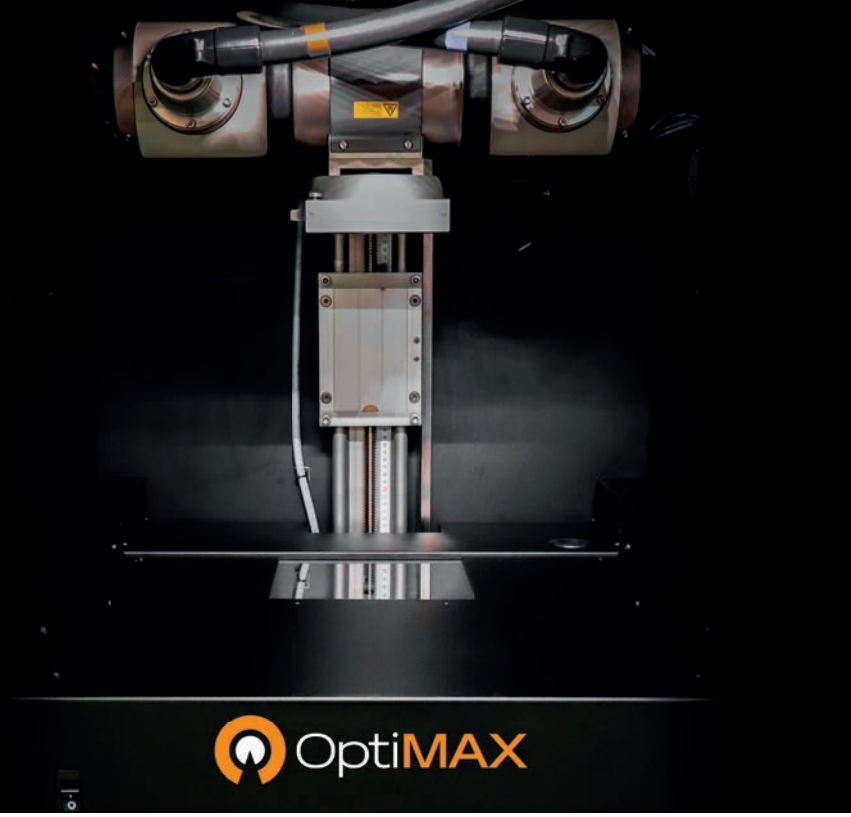
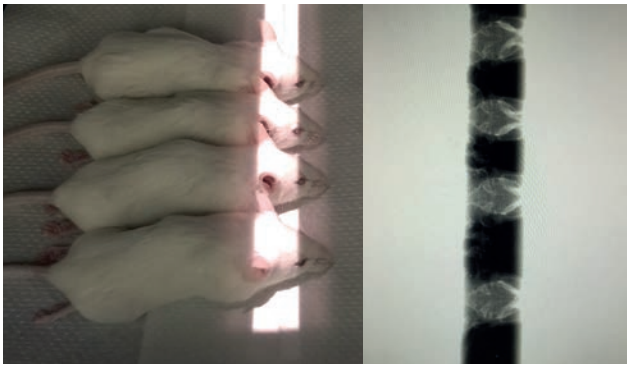
Applications

- Longitudinal Molecular Imaging
- Multi-Animal Imaging and Treatment Targeting
- Treatment Alignment Verification
- Compatible with X-ray Luminescent Nanoparticle imaging
- Radioisotopic Imaging



Multi-Animal Imaging & Treatment

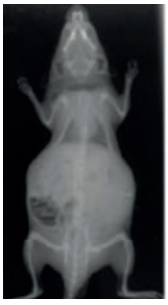
The x-ray images of a mouse, multiple mice, rats or large animals can be captured first by capturing an image of the entire x-ray field at a low kV.



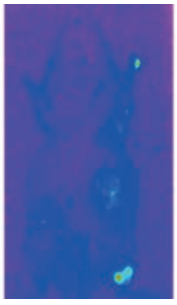
A collimated RT treatment field can (then) be chosen either with a fixed collimator or with the X-Rad Adjustable Collimator. When the collimated high kV x-ray dose is delivered, a short image of the collimated irradiation field can be captured. The collimated field can then be overlaid on the initial x-ray image for precise localization of the delivered RT dose on the sample.

Nanoparticles

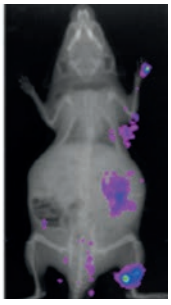
Many new x-ray luminescent materials such as nanoparticles are being researched for improving the targeting and for delivering enhanced therapeutics during x-ray radiation therapy.



X-ray at 40 kV



X-ray luminescent nanoparticles



Contrast overlay

In the example above, the mouse has received an injection in one hind leg of an x-ray luminescent nanoparticle which has been shown to give off significant levels of light during whole body irradiation of the animal.

OptiMAX

Imaging Chamber

Shielded chamber inserts at the bottom of the X-Rad Biological Irradiator protects camera and electronics from high energy x-ray irradiation

Imaging System

Folded Mirror style chamber ensures limited direct high energy x-ray flux on camera CCD chip

Cooled CCD Camera cooled to between -60C and -80C in 22C lab environment

Cooled CCD chip 1024 x 1024 (1 Megapixel)
B&W Full Frame Transfer

Sensor Size 13.3 x 13.3 mm

Pixel Size 13 x 13 um

Lens Fixed, fast f/0.95

Image Resolution ~200 um/pixel

Binning 2x2, 4x4, 8x8

Dark Current <=3x10-4 e/Pixel/Sec

Ultra Low Noise:
Read Noise <2.9 e rms (Nominal) at 0.05MHz read rate

Quantum Efficiency @ 550nm > 95%

Automated x-ray screen slider for switching between X-ray and Optical/Luminescent modes

Supplied with animal imaging chamber and 5 mice anesthesia manifold (anesthesia system sold separately)

6 position emission filter wheel (emission filters sold separately)

Computer and Software

Windows based PC workstation

OptiMAX Image Capture Software Suite
Note: Image Analysis software to be purchased separately

Installation and Training

The system will be fully installed into the X-Rad system in your facility

X-Rad chamber modifications to limit amount of ambient light in the chamber will be implemented

Training on the operation and use of the imaging system and software will be supplied.

Options

Emission Filters (add-on)
Studies of bioluminescence and radioluminescence materials may include wavelength studies that can be enhanced with emission filters.

Emission filter wavelenghts at 440nm, 530nm, 600nm, 670nm, 700nm, 720nm, 790nm, and 830nm

Small Animal Active Anesthesia System (add-on)
Active Exhaust unit w/ Well-fill Isoflurane vaporizer is designed for safe, simple, and controllable inhalation anesthesia with active exhaust for mice, rats, small rodents, and exotics

- Accurate Multi-Delivery System, 6psi
- 3 Flowmeters and Switches
- Isoflurane Funnel fill Vaporizer
- Anesthesia Exposure Prevention System
- 3-Station Flowmeter Controlled Vacuum System for Actively Scavenging Waste Gas from Devices
- Large Induction Chamber Clear, Active Vacuum Style (9 Liter)

OptiMAX vs Competitor

	Precision X-Rad OptiMAX	IVIS Lumina
Animal Capacity:	3-5 mice	3 mice
Optical FOV:	18cm x 18cm	5 - 12 cm
CCD Size:	1.3cm x 1.3cm	1.3cm x 1.3cm
Imaging Pixels:	1024 x 1024	1024 x 1024
X-ray Imaging:	Yes	In some models
Radiation Treatment:	Yes	Not available

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